WHAT IS CLAIMED IS:

1. A macromolecule of the structure:

PNA-DNA-PNA

wherein:

said DNA comprises at least one 2'-deoxynucleotide; and

each of said PNAs comprise at least one peptide nucleic acid subunit.

2. A macromolecule of claim 1 wherein said PNA-DNA-PNA macromolecule is capable of specifically hybridizing to a strand of nucleic acid.

3. A macromolecule of claim 2 wherein said stand of nucleic acid is a RNA strand.

4. A macromolecule of claim 1 wherein:

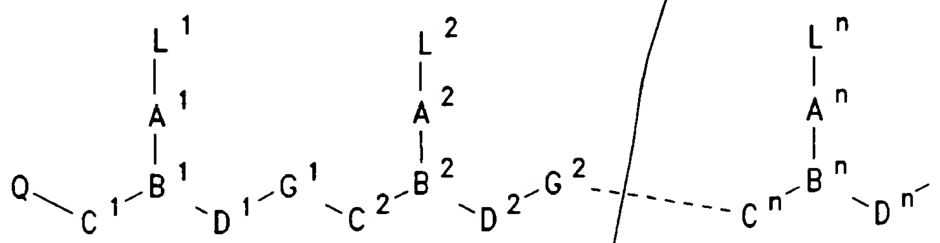
said DNA includes at least three 2'-deoxynucleotides linked together in a sequence: and

each PNA includes at least two peptide nucleic acid subunits.

5. A macromolecule of claim 1 wherein said 2'-deoxynucleotide is a phosphodiester, a phosphorothioate or a phosphorodithioate nucleotide.

6. A macromolecule of claim 1 wherein said DNA includes at least three 2'-deoxynucleotides linked together in a sequence by phosphodiester, phosphorothioate or phosphorodithioate linkages.

7. A macromolecule of claim 1 wherein each of said PNAs comprises a compound of the formula (I):



(I)

wherein:

n is at least 2,

each of L^1-L^n is independently selected from the group consisting of hydrogen, hydroxy, $(C_1$-$C_4)$alkanoyl, naturally occurring nucleobases, non-naturally occurring nucleobases, aromatic moieties, DNA intercalators, nucleobase-binding groups, heterocyclic moieties, and reporter ligands, at least one of L^1-L^n being a naturally occurring nucleobase, a non-naturally occurring nucleobase, a DNA intercalator, or a nucleobase-binding group;

each of C^1-C^n is $(CR^6R^7)_y$ where R^6 is hydrogen and R^7 is selected from the group consisting of the side chains of naturally occurring alpha amino acids, or R^6 and R^7 are independently selected from the group consisting of hydrogen, $(C_2$-$C_6)$alkyl, aryl, aralkyl, heteroaryl, hydroxy, $(C_1$-$C_6)$alkoxy, $(C_1$-$C_6)$alkylthio, NR^3R^4 and SR^5, where R^3 and R^4 are as defined above, and R^5 is hydrogen, $(C_1$-$C_6)$alkyl, hydroxy-, alkoxy-, or alkylthio- substituted $(C_1$-$C_6)$alkyl, or R^6 and R^7 taken together complete an alicyclic or heterocyclic system;

each of D^1-D^n is $(CR^6R^7)_z$ where R^6 and R^7 are as defined above;

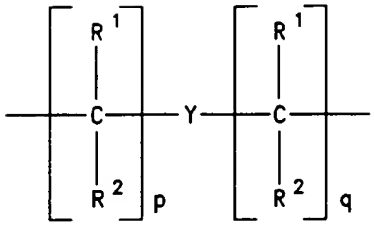
each of y and z is zero or an integer from 1 to 10, the sum y + z being greater than 2 but not more than 10;

each of G^1-G^{n-1} is $-NR^3CO-$, $-NR^3CS-$, $-NR^3SO-$ or $-NR^3SO_2-$, in either orientation, where R^3 is as defined above;

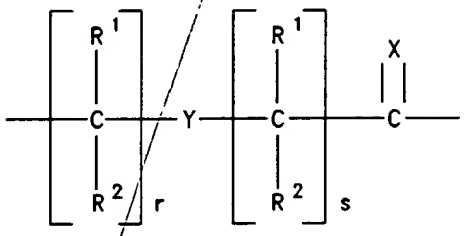
each pair of A^1-A^n and B^1-B^n are selected such that:

(a) A is a group of formula (IIa), (IIb) or (IIc) and B is N or R^3N^+; or

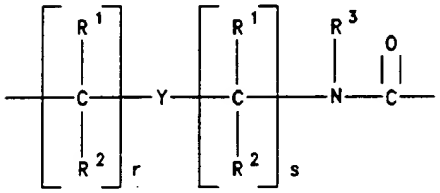
(b) A is a group of formula (IId) and B is CH;



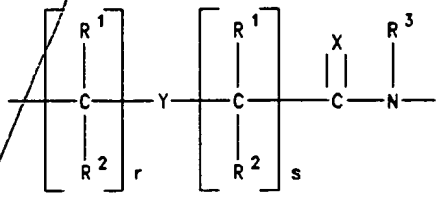
(IIa)



(IIb)



(IIc)



(IId)

where:

X is O, S, Se, NR^3, CH_2 or $C(CH_3)_2$;

Y is a single bond, O, S or NR^4;

each of p and q is zero or an integer from 1 to 5, the sum p+q being not more than 10;

each of r and s is zero or an integer from 1 to 5, the sum r+s being not more than 10;

each R^1 and R^2 is independently selected from the group consisting of hydrogen, (C_1-C_4)alkyl which may be hydroxy- or alkoxy- or alkylthio-substituted, hydroxy, alkoxy, alkylthio, amino and halogen;

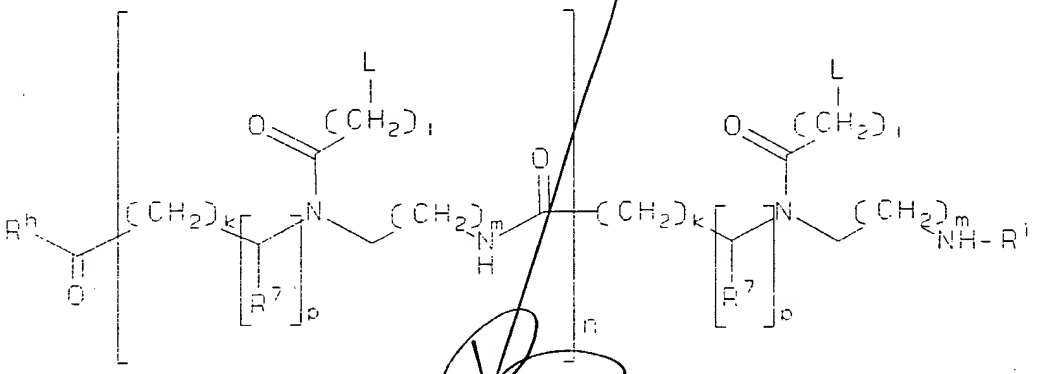
each of G^1-G^{n-1} is $-NR^3CO-$, $-NR^3CS-$, $-NR^3SO-$ or $-NR^3SO_2-$, in either orientation, where R^3 is as defined above;

Q is $-CO_2H$, $-CONR'R''$, $-SO_3H$ or $-SO_2NR'R''$ or an activated derivative of $-CO_2H$ or $-SO_3H$; and

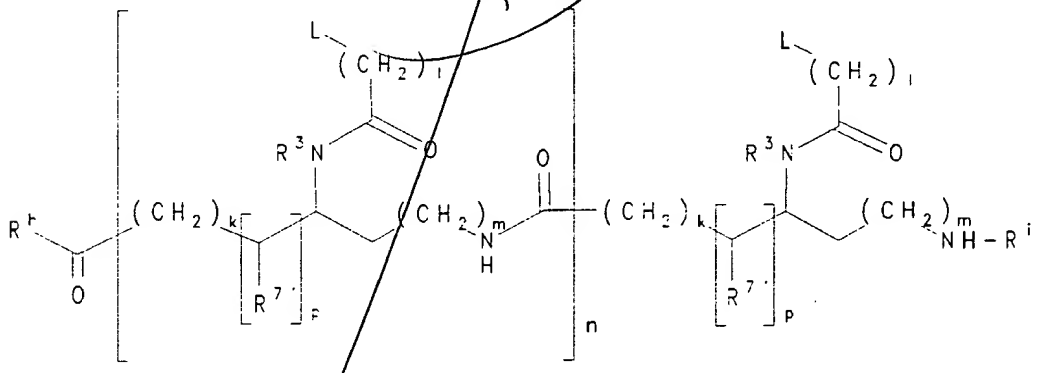
I is $-NHR'''R''''$ or $-NR'''C(O)R''''$, where R', R", R''' and R'''' are independently selected from the group consisting of hydrogen, alkyl, amino protecting

groups, reporter ligands, intercalators, chelators, peptides, proteins, carbohydrates, lipids, steroids, nucleosides, nucleotides, nucleotide diphosphates, nucleotide triphosphates, oligonucleotides, oligonucleosides and soluble and non-soluble polymers.

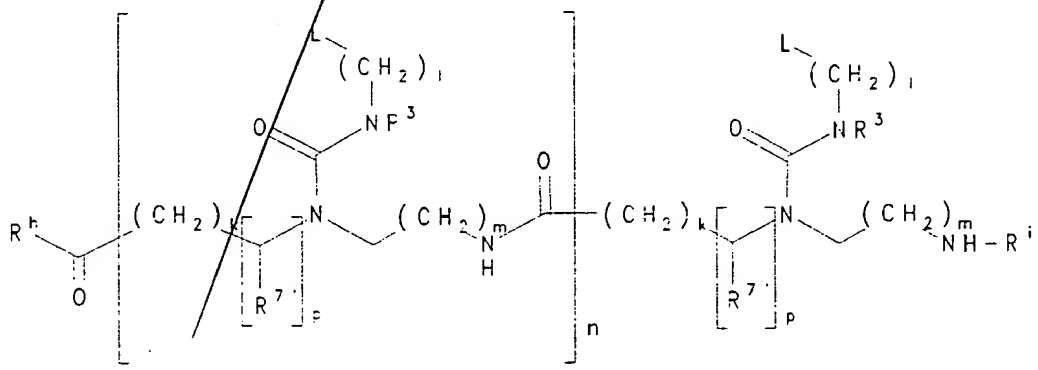
8. A macromolecule of claim 1 wherein each of said PNAs comprises a compound of the formula IIIa, IIIb or IIIc:



(IIIa)



(IIIb)



(IIIc)

wherein:

each L is independently selected from the group consisting of hydrogen, phenyl, heterocyclic moieties, naturally occurring nucleobases, and non-naturally occurring nucleobases;

each $R^{7'}$ is independently selected from the group consisting of hydrogen and the side chains of naturally occurring alpha amino acids;

n is an integer from 1 to 60;

each of k, l, and m is independently zero or an integer from 1 to 5;

p is zero or 1;

R^h is OH, NH_2 or -NHLysNH$_2$; and

R^i is H or $COCH_3$.

9. A macromolecule of claim 8 where each of said PNAs comprise a compound having formula (IIIa)-(IIIc) wherein each L is independently selected from the group consisting of the nucleobases thymine (T), adenine (A), cytosine (C), guanine (G) and uracil (U), k and m are zero or 1, and n is an integer from 1 to 30, in particular from 4 to 20.

10. A compound of claim 9 wherein:

said DNA includes at least three of said 2'-deoxynucleotides linked together in a sequence:

each PNA includes at least two peptide nucleic acid subunits; and

said 2'-deoxynucleotides are joined via phosphodiester, phosphorothioate or phosphorodithioate linkages.

11. A macromolecule of claim 1 wherein each of said PNAs is covalently bound to said DNA with an amide, amine or ester linkage.

12. A macromolecule of the structure:

PNA-(amide link)-DNA-(amide link)-PNA:

wherein:

said DNA comprises at least one 2'-deoxynucleotide;

each of said PNAs comprise at least one peptide nucleic acid subunit; and

each of said amide links includes an amide linkage of the structure:

-C(=O)-NH- or -NH-C(=O)- .

13. A method of treating an organism having a disease characterized by the undesired production of a protein, comprising contacting the organism with a macromolecule that has structure PNA-DNA-PNA and that includes a sequence of nucleobases capable of specifically hybridizing to a strand of nucleic acid coding for said protein, wherein:

said DNA includes at least one nucleotide having a 2'-deoxy-erythro-pentofuranosyl sugar moiety covalently bound to one of said nucleobases; and

each of said PNAs include at least one peptide nucleic acid subunit having a covalently bound nucleobase.

14. A method of claim 13 wherein said nucleotide is a phosphorothioate nucleotide.

15. A method of claim 13 wherein said nucleotide is a phosphorodithioate nucleotide.

16. A method of claim 13 wherein said nucleotide is a phosphodiester nucleotide.

17. A pharmaceutical composition comprisinga pharmaceutically effective amount of a macromolecule of claim 1 and a pharmaceutically acceptable diluent or carrier.

18. A method of *in vitro* modification of sequence-specific nucleic acid, comprising contacting a test solution containing RNase H and said nucleic acid with a macromolecule of claim 1.

19. A method of enhancing polynucleotide hybridization and RNase H activation in a organism, comprising contacting the organism with a macromolecule of claim 1, wherein:

said macromolecule has a sequence of nucleobases capable of specifically hybridizing to a complementary strand of nucleic acid; and

some of said nucleobases are located on the PNA portions of said macromolecule and some of said nucleobases are located on the DNA portion of said macromolecule.

20. A method of treating an organism having a disease characterized by the undesired production of a protein, comprising contacting the organism with a compound of claim 1.

21. A method of *in vitro* modification of sequence-specific nucleic acid, comprising contacting a test solution containing RNase H and said nucleic acid with a compound of claim 10.

22. A method of treating an organism having a disease characterized by the undesired production of a protein, comprising contacting the organism with a compound of claim 10.

23. A pharmaceutical composition comprising a pharmaceutically effective amount of a compound of claim 10 and a pharmaceutically acceptable diluent or carrier.